

III. REMARKS

Claims 1-66 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. For the reasons discussed below, Applicant respectfully traverses this rejection.

Claims 1, 7, 13, and 19 relate to a method of facilitating maintenance of a primary index. As discussed in Applicant's patent application:

IMS requires that a HIDAM primary index contain a direct pointer to the root segment. If the root segments are moved during a database reorganization, then the HIDAM primary index must be re-built to point at the root's new location. Therefore, placing root segments 64 in fixed locations, such as on the right side of a block 66, provides significant advantages which is unique to the present invention. *See Fig. 6.* If the root segments are retained in their storage locations and not moved during a reorganization, then the HIDAM primary index does not need re-building. In the present invention, the step of retaining a root segment in a fixed storage location can also include retaining the root segment in the same relative location within a dataset, after it has been added to the database.

Applicant's patent application, p. 16, line 27 – p. 17, line 8. Thus, the steps set forth in claims 1, 7, 13, and 19 (e.g., "retaining each root segment in its storage location") facilitate maintenance of an index by not requiring it to be rebuilt after reorganization. Applicant has amended claims 1, 17, 13 and 19 to more particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

In response to the Examiner's comment that "it is not clear how data reorganization is performed while each root segment is being retained in its storage location," Applicant notes that although database root segments are not moved during a database reorganization, all non-root segments in the database may be moved. *See Applicant's application, p. 16, lines 7-26.*

In response to the Examiner's rejection of claims 22, 26, 31 and 37 under 35 U.S.C. § 112, second paragraph, and the Examiner's objection to the drawings, Applicant respectfully directs the Examiner's attention to Figures 5-9, as well as the corresponding text below from Applicant's patent application:

Fig. 5 illustrates the general architecture for implementing this aspect of the present invention. In the present invention, a secondary index record 50 contains: (i) a direct pointer (Ptr) 56 which points at the target segment 62 in the target database 54; (ii) the secondary index's key field 58, and (iii) a proprietary token 60 which is used to correct the direct pointer after the target database has been reorganized. The implementation of the token is unique to the present invention.

As is well known in the art, a secondary index always points at a designated segment type (target segment) in the target database. The segment type may be the root segment of a database record, or non-root segments in a database record. In either case, the pointer contains the relative byte address (RBA) of the target segment.

Fig. 6 illustrates the status of a secondary index of the present invention before reorganizing the target database, whereas Fig. 7 illustrates the status of the secondary index after reorganizing the target database. The direct pointer 56 of the secondary index record 52 points at a target segment 62. In the present invention, if target segment 62 is a root segment, then it does not need to be corrected after a reorganization. Thus, the secondary index would be the same as that illustrated in Fig. 6. If target segment 62 in the target database 54 is a non-root segment which has been moved during a reorganization, then the pointer 56 may become invalid as illustrated in Fig. 7 (*i.e.*, it does not point to target segment 62). The direct pointer may need correcting at some point in time.

In the present invention, the following conditions will facilitate the correction of direct pointers in secondary index records after a target database has been reorganized:

1. Database root segments may not be moved during a database reorganization. For example, as is discussed below, in one embodiment of the present invention, such root segments are placed in fixed locations on the right side of a block 66 in the target database 54.
2. All non-root segments in the database may be moved during a database reorganization.

3. All segments in the Target Database contain a unique identifier, such as a token which includes the segment's born-on-date. *See, e.g.,* Figs. 2 and 3.

4. All Index Records in the Secondary Index contain the same unique identifier or token.

5. The token 60 in the Index Record 52 may also contain the "key" 58 of the Root Segment 64 for the Target Database record, and the born-on-date of the Index Target Segment 62 in the Target Database record. The "key" could be either the Root Segment's key field or its RBA since both uniquely identify a root segment. "Key" 58 may also be a separate field from token 60.

IMS requires that a HIDAM primary index contain a direct pointer to the root segment. If the root segments are moved during a database reorganization, then the HIDAM primary index must be re-built to point at the root's new location. Therefore, placing root segments 64 in fixed locations, such as on the right side of a block 66, provides significant advantages which is unique to the present invention. *See* Fig. 6. If the root segments are retained in their storage locations and not moved during a reorganization, then the HIDAM primary index does not need re-building. In the present invention, the step of retaining a root segment in a fixed storage location can also include retaining the root segment in the same relative location within a dataset, after it has been added to the database.

The above description refers to storage locations called "blocks." In IMS, a "block" typically refers to one row of data in memory containing multiple rows. Those skilled in the art will appreciate, however, that the present invention is applicable to multiple configurations and types of memory and storage, and the use of the term "block" herein does not limit the scope of the invention to a particular configuration or type of memory or storage.

Fig. 8 illustrates the logic flow of a program that could be utilized by the IMS program to carry out this aspect of the present invention. Such a program would be utilized by the IMS program at the point in time that it receives a request from an application program (A/P) for a database segment via a secondary index. The programming conventions used by an A/P when requesting services from IMS using the DLI Call interface are known in the art.

In step 68 of Fig. 8, when IMS receives an A/P request to retrieve a target segment via a secondary index, it extracts the index's key from the A/P's read request. This key is then used to read an Index Record from the secondary index's dataset in step 70. A Direct Pointer (RBA) to the Target Segment in the

Target Database is then extracted from the Index Record in Step 72.

In step 74, when IMS retrieves the data at the specified RBA, a check is made to insure that it contains a valid Target Segment. To determine if it is a valid Target Segment, IMS first checks the segment code of the data at the specified RBA and compares it to the actual segment code, which is maintained in the index record, for the Target Segment. The segment code is the first byte of each segment. If the segment codes do not match, then it is determined that a valid Target Segment was not found. If the segment codes match, then a valid Target Segment may have been found, but a second check is made. For the second check, the born-on-date (or other unique identifier) in the token of the segment data at the specified RBA is compared to the born-on-date (or other unique identifier), which is maintained in the token field of the index record, for the target segment. If the born-on-dates do not match, then a valid target was not found.

If the target RBA contains a valid Target Segment, normal processing continues. If the target RBA does not contain a valid Target Segment, then in step 76 a program, such as the one described below in connection with Fig. 9, can be invoked to resolve the problem.

Fig. 9 illustrates the logic flow of a program that would be suitable for correcting the Direct Pointer in the secondary index record. First, in step 78, the information needed to resolve the direct pointer is extracted from the Token field in the Secondary Index record. The Token can contain the following pieces of metadata which uniquely identifies a specific Target Segment in the Target Database: (1) the Key of the Root Segment which contains the Target Segment; and (2) the Born-On-Date (BOD) of the Target Segment which is contained in the Token of the Target Segment. These two pieces of metadata are extracted in step 80.

In step 82, the program requests IMS to read the specified Root Segment and all of its dependent segments. As each dependent segment is retrieved in step 84, its Token is examined to check for a matching BOD. When the valid Target Segment is encountered, in step 86 its location (*i.e.*, RBA) is then placed into the Secondary Index record. Thus, the Secondary Index record is now corrected for subsequent references to it.

Based at least on these figures and the corresponding text, Applicant respectfully submits that claims 22, 26, 31, and 37 do correspond to what is shown in these figures, and these drawings adequately show the features of Applicant's claimed invention.

IV. CONCLUSION

In view of the amendments and remarks set forth herein, the application is believed to be in condition for allowance and a notice to that effect is solicited. Nonetheless, should any issues remain that might be subject to resolution through a telephonic interview, Examiner is requested to telephone the undersigned at (512) 370-2858.

Respectfully submitted,

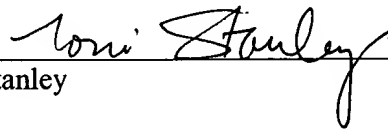


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CERTIFICATION UNDER 37 C.F.R. § 1.8

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